provided that the author has duly declared himself a candidate. Every treatise must be in print and in the English language, and must bear the name of its author. It seems to be contemplated that some definite problem will always be involved in the subject announced, the solution of which will be considered as the essential condition of success. But if it shall appear that although this has not been accomplished any candidate has made valuable progress towards its accomplishment, or has even incidentally made some discovery of practical importance, the merits of such candidate will be recognised by the award of a part of the sum offered.

Such is the scheme; we think it will be generally regarded as well adapted for the accomplishment of the end proposed. The objections to which it is liable are exclusively those which are applicable to all similar schemes for the encouragement of research by pecuniary endowment.

To the Discovery Prize we attach less value than to the other. In the natural sciences discoveries are usually made by men to whom the prospect of a reward, however munificent, would not be a sufficiently strong reason to induce them to change the course or purpose of their investigations. It is the consideration of this fact, no doubt, which has led the Company, we think very wisely, to determine to accept published researches in competition; but here the difficulty at once arises, for the discovery must relate to a particular question previously announced. How will the selection of this question be made?

It is clearly desirable that on each occasion the problem selected should be one which will certainly meet with its solution during the next four years—and therefore one as to which investigation is already in progress. To anticipate what will and must soon be discovered is half way towards discovery, and consequently demands, on the part of the individuals intrusted with the selection, powers at least equal to those which it is proposed to recognise in the bestowal of the prize. Nothing could be better than that Prof. Tyndall, Mr. Simon and the other scientific advisers of the Company should have the opportunity given them, or rather the duty imposed upon them, of publishing these forecasts of the probable progress of knowledge in relation to the causes of disease, for, even if their prognostications serve no other purpose, they will at least be of use in directing inquiry into the most promising channels.

The more important division of the scheme—that which relates to the scholarships—is open to no objections of the kind referred to above. Its purpose is simple, and the way in which it is proposed to carry it out effectual. It is of course quite as impossible to make a worker of a man by giving him a scholarship as to make a discoverer of him by offering him a prize, but there is this difference between the two cases, that the endowment *enables*, the prize only *rewards*. The scholarships are limited to candidates under thirty-five. Among men of this age who are now working at pathology in this country we may be sure that there are some who are doing so, if one may so express it, at the cost of life, for they are devoting to investigations which certainly will not pay, time which could otherwise be spent with direct advantage to themselves; and that there are among such men some at least who are fitted by nature to undertake the work of investigation, and have the additional qualifications afforded by training in scientific methods. Their number is no doubt very inconsiderable, for pathology as a science is of very recent birth. It is the offspring of physiology, and has only just arrived at such a stage of development as to claim an independent position. By reason of its being in this evolutionary condition it happens in pathology, as in all other sciences during the initial stage of their growth, that the more work is done the more is required—the completion of each bit of research only preparing the way for fresh investigations. New methods, new applications of physical, chemical, or physiological knowledge to the problems which relate to the causes of disease, are being brought within reach of the pathological worker every year, but all of these require *work* to make them fruitful. There is therefore not the least reason for apprehending that there will be any difficulty in finding subjects for future inquiries. It is far more doubtful whether the men possessing the qualifications which have been already indicated will be forthcoming. At first, if we are not mistaken, the choice will be very restricted, but each year will bring an accession of strength to the ranks of the competitors, so that if in the first instance the Company should be advised for want of suitable applicants to allow one or more of their scholarships to remain vacant, they will act wisely in delaying the appointment.

We do not think that the difficulty will arise, for the tide has already turned. Practical medicine, which has hitherto been strangely indifferent to the science on which it professes to be founded, is awakening to the importance of scientific investigation of the cause and nature of diseases. Among indications of the change may be mentioned the origin and successful progress of the new "Association for the Advancement of Medicine by Research," which has begun its function by devoting its funds to an inquiry into the etiology of tuberculosis. Another fact of equal moment as indicating the recognition of pathology as a special subject of study, is the intended establishment of a Professorship of the science in the University of Cambridge—an example which will no doubt soon be followed by the sister University. When this shall have been accomplished it may be hoped that the great educational institutions which are attached to Guy's, Bartholomew's, and St. Thomas's Hospitals may be also induced to follow the example of the Worshipful Company of Grocers, by doing something more than they have done hitherto to encourage and provide for "the making of exact researches into the causes of important diseases and the means whereby these causes may be prevented or obviated."

ELEMENTARY METEOROLOGY

Elementary Meteorology. By R. H. Scott, M.A., F.R.S., Secretary to the Meteorological Council. (London: Kegan Paul, Trench, and Co., 1883.)

MR. SCOTT'S aim in this text-book of meteorology is to explain the conditions required for the successful prosecution of the science, and to show in some detail the more prominent of the results which have already been arrived at. The various instruments are figured and described, and the methods of observing detailed at length; and emphasis is laid on the necessity of securing accurate observations, and of paying attention, in making arrangements for observing, to the few simple and obvious principles which underlie the science. An account is then given of the geographical distribution of temperature, pressure, and the other phenomena of meteorology, particularly those which are usually comprised under the heads of climate and weather. The book is a highly successful one, and evinces a full and ready knowledge of the work which has been done by the meteorologists of this and other countries down to the present time, and we must not omit to add that there is an earnest endeavour manifested throughout to give the fullest credit to the first discoverers of the more important facts and principles.

The following extracts, in explanation of hill and valley winds and the distribution of rain and weather on the two sides of a mountain-chain, show the general style of the book:—

> "The day wind brings up moisture to the upper strata of the atmosphere, and this is condensed, forming caps on the mountain-tops, and often giving rise to thunderstorms. The night wind, a descending current, carries the moisture with it, and so the highest peaks are oftenest clear in the early morning. The reasons of this rhythmical change in air-motion are to be sought for in the action of heat. In the daytime the air in the valleys and on the lower slopes of the mountains becomes heated and expanded. The isobaric surfaces over such districts rise, and the air so raised has a tendency to flow towards the mountains and up the upper valleys as long as the heat action over the lowlands is maintained. At night the temperature in the valleys falls, and the air lying in them contracts, producing a partial vacuum. This causes the air above to descend, so that a downward current is generated, which lasts all through the night. . . .
>
> "When wind coming in from the sea, and therefore charged with moisture, meets a mountain-chain, it is forced to rise; it is cooled by rising, and made to give up much of the vapour it brings with it in copious rains. The result is that the air is rendered dry and cold. If now the average height of the cols of the chain above the plain country beyond be 4000 feet, the air in its descent may receive an increment of temperature of over 20°·0, and as at the same time its capacity for containing moisture will be increased, it will be felt as a dry hot wind. This is the explanation of the characteristics of the Föhn of Switzerland."

This gives the true explanation of the increased humidity observed during the hottest hours of the day on the Faulhorn and similar elevated situations.

A long extract is given (pp. 269-275) from Laughton's "Physical Geography," summarising the broad features of atmospherical circulation as exemplified by the trades and anti-trades, in which it is stated that in both hemispheres to the north or south of the parallel of 30° or 40° a strong westerly wind blows with great constancy all round the world;—and that, alike in the Atlantic and Pacific; in North America, west of the Rocky Mountains; in the Eastern States; in European Russia and Germany, and in Northern Asia, there is found the same predominance of westerly winds. A more decided objection might have been made to the above view than by stating that the winds of the temperate zone and of the higher latitudes seem to be regulated by the distribution of pressure. Laughton's statement might possibly be accepted if we had before us little more than Horsburgh and the other directories of the navigator. In the north-west of Iceland observations show on the mean of the year 212 days when the wind blows from some easterly point, and only 71 days when it blows from any westerly point, and these prevailing winds of Iceland are essentially typical of the winds of an extensive region of the north. The cyclonic and anticyclonic systems of winds observed on the surface of the earth in connection with the well-known seasonal areas of low and high pressure are not merely surface winds, but extend to a considerable height in the atmosphere. This is evident from the consideration that in winter, pressure is 1·115 inch higher in Siberia than in Iceland, and in summer 0·860 inch higher in the Atlantic than in the south-west of the Punjaub in the same latitudes, and that great disturbances of the equilibrium of the atmosphere must necessarily obtain to very great heights. It therefore follows that over large portions of the northern hemisphere gradients for prevailing westerly winds cannot be formed within many thousand feet of the earth's surface.

Mohn's happy classification of thunderstorms into heat thunderstorms and cyclonic thunderstorms is adopted and illustrated. The former is the type which predominates in summer and in hot climates, while the latter are characteristic of our Atlantic coasts, Iceland, and Norway, and are a not infrequent accompaniment of cyclonic disturbances. Cyclonic thunderstorms have their maximum period in winter, and though they occur at all hours of the day, yet long-continued observations show a distinct diurnal period having the maximum during the night; and in some regions so strongly marked is this phase that, of the twenty-three cyclonic thunderstorms which occurred in Iceland in fourteen years, only three took place at an hour of the day when the sun was above the horizon. On the other hand, heat thunderstorms are most frequent during the hottest period of the day, or during the early afternoon.

Sheet lightning and the so-called summer or heat lightning are stated to be nothing else than the reflection of, or the illumination produced by, distant electrical discharges. This opinion, so long and generally entertained, is not supported by observation. At Oxford, during the twenty-four years ending 1876, the following are the number of times which thunder, with or without lightning, and lightning unaccompanied with thunder, have been recorded during May, June, July, and August, from 3 p.m. to 4 a.m.:—

	Thunder.	Lightning.		Thunder.	Lightning.
3-4 p.m.	17	0	10-11 p.m.	12	13
4-5 ,,	27	1	11-mid.	8	30
5-6 ,,	29	0	mid.-1 a.m.	7	27
6-7 ,,	21	0	1-2 ,,	11	27
7-8 ,,	21	2	2-3 ,,	12	10
8-9 ,,	8	1	3-4 ,,	3	3
9-10 ,,	7	7			

Thus at Oxford the hours of maximum occurrence of thunder is from 4 to 6 of the afternoon; but the hour of maximum occurrence of sheet lightning or heat lightning is delayed till about midnight. These different times, but above all the larger number of cases of heat lightning over thunder about midnight, which are nearly as 7 to 2, proves that a large proportion of these cases of heat lightning at Oxford were not the reflection of distant electrical discharges or thunderstorms, and this conclusion is amply confirmed by similar observations made in other parts of the globe. A very large number of these cases of sheet lightning at Oxford are, as suggested by Prof. Loomis in 1868, due to the escape of the electricity of the clouds in flashes so feeble that they produce no audible sound, and they occur when the air being very moist offers just sufficient resistance to the passage of the electricity to develop a feeble light.

SALVADORI'S PAPUAN ORNITHOLOGY

Ornitologia della Papuasia e delle Molucche, di Tommaso Salvadori. Parte terza. 4to. pp. 597. (Torino, 1882.)

THE completion of the third and concluding portion of Count Salvadori's great work upon the Birds of New Guinea and the adjoining Islands is an event that should be duly chronicled. We have already spoken of the plan of this great undertaking, and of the excellent way in which it has been carried out, in our notices of the preceding volumes (see NATURE, vol. xxiii. p. 240, and vol. xxiv. p. 603). We will now say a few words upon he general results arrived at.

The ground covered by the present work embraces, it must be recollected, the whole of the northern portion of the great Australian region. The mainland of this district is New Guinea, but it also contains the islands of the Moluccan Archipelago up to "Wallace's Line," besides various groups situated to the east and south-east of New Guinea, and extending as far as the Solomon Islands. In the "Papuan Sub-region," as it is generally called, thus constituted, it will be evident that variation must necessarily play a much more important part than in the solid continent of Australia. Not only do the species isolated in the different islands obtain a better chance for the exaggeration of their peculiarities (as has been so well shown by Mr. Wallace in his "Island Life"), but in the mainland of New Guinea we find mountains reaching to such an altitude as to cause the presence of a very different fauna from that of the adjoining lowlands. From these two causes it would be naturally expected that the ornithology of the Papuan Sub-region would be more rich in species than that of Australia proper. And such, indeed, is shown to be the case by the completion of Count Salvadori's work, whereby the first summary has been effected of the Papuan Ornis, since recent researches have revealed to us its luxuriance. In Mr. Gould's great work upon the Birds of Australia little more than 700 species of birds are given as inhabitants of the whole of that great continent. By Count Salvadori's volumes, we find that 1028 species are already known to us from the Papuan Sub-region, and, as we all know, a very large portion of New Guinea and many of the adjacent islands are still *terra incognita*. Much therefore remains to be added to the Papuan Avi-fauna, whilst in Australia the subject is comparatively exhausted.

Taking a general survey of the forms of Papuan bird life, we see at once how nearly akin it is to that of Australia. Recent researches especially have shown that nearly all the peculiar forms of the Australian Ornis have their representatives in the Papuan Sub-region. Some of these forms, however (for example, the Paradise-Birds and the Cassowaries), are much better represented in the Papuan Islands than on the Australian Continent, and the Papuan Islands must be regarded as their original home, whence they have sent forth stragglers into the Southern Continent.

Such general facts as regards the distribution of bird life in the Australian Region may be easily gathered from an inspection of the contents of the present work. But our author, we are glad to see, promises us to put them forward in his own shape, in an "Introduction to the Ornithology of Papuasia and the Moluccas," which he is now preparing. In this supplementary volume will be likewise given chapters on the history and bibliography of the subject, and a chart to illustrate its somewhat complicated geography. Count Salvadori is evidently determined to spare no trouble in order to render complete the results of his eight years' hard labour on the Birds of Papuasia and the Moluccas.

OUR BOOK SHELF

Cutting Tools Worked by Hand and Machine. By Robert H. Smith, M.I.M.E. (London: Cassell, Petter, Galpin, and Co., 1882.)

STUDENTS of mechanical engineering, and more especially those who study machine tool construction, have up to the present time found it very hard to obtain a suitable text-book relating to the theoretical part of the subject; hitherto almost the only books relating to it have been published in Germany.

This work comes to hand at a time when the want of such a work is much felt, and students attending mechanical engineering classes will find that it will help them considerably in understanding the construction, theoretically and practically, of the machines dealt with. The author in his preface states distinctly that he does not intend the book to be a descriptive treatise on tools, nor does he refer to all the different cutting tools in use, but he has happily chosen the more important machines, and gives a very full description and illustration of each. The subject of driving power is dealt with and fully explained, and results of experiments carried out by the author on the subject are carefully arranged in tables.

In the first chapters cutting tools for wood are discussed, the wedge action of any cutting tool being clearly described and illustrated; also the method of grinding and setting edge tools, frequently a very difficult task for beginners to accomplish. He also gives the results of experiments carried out by himself on the power required to be exerted through certain tools when doing a fixed amount of work, an interesting subject from a theoretical point of view.

The chapter on chipping-chisels and hand-planes fully explains the action and construction of the several tools, the different angles of the cutting-edge of cold chisels are shown, and the author points out the reasons for varying the angle according to the quality of the metal. The whole chapter goes into the subject practically, the explanations being clear and to the point. The next chapters deal more especially with wood-working machinery. The variety of teeth used in the different kinds of saws, including inserted teeth, are amply illustrated, the important matter of setting the teeth being fully explained, with experiments showing the power absorbed in driving the different saws, this also being usefully arranged in tables; after which the author goes on to explain the different machines used in working the metals, milling machinery having its full share of the text. The cutting speed and rate of feed for milling-cutters is gone into, and in the latter part of the chapter the milling-cutters themselves are dealt with.

Chapter V. relates to the various methods of planing